Application No. 09/914,456
Filed: August 28, 2001
TC Art Unit: 2625
Confirmation No.: 5339

AMENDMENTS TO THE CLAIMS

1. (currently amended) A process for noise reduction from noisy data representing an artifact at sample points in two dimensional space of a wafer specimen, comprising the steps of:

receiving said noisy data as a vector, each element of which corresponds to one sample point; and

calculating coefficients of a polynomial which converts said noisy data vector to a two dimensional function continuously representing the artifact in the two dimensional space,

wherein said noisy data is obtained using a measuring apparatus, and

wherein said calculating step includes mathematically multiplying said data vector by a matrix representing a noise characteristic of said measuring apparatus.

2. (previously presented) The process of claim 1 wherein said sample points lack regular geometrically prescribed locations on said wafer specimen.

3. (previously presented) The process of claim 1 wherein said wafer specimen is a non-rectilinear specimen.

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4. (previously presented) The process of claim 1 wherein the sample points have a sufficiency to represent the spatial frequency of the noise to be reduced.

5. (original) The process of claim 1 wherein said polynomial is a Zernike polynomial.

6. (original) The process of claim 1 wherein said calculated coefficients are fewer in number than the number of sample points.

7. (currently amended) The process of claim 1 ~~wherein said noisy data is obtained using a measuring apparatus and~~ wherein said calculating step includes ~~the step of~~ mathematically multiplying said data vector by ~~a~~ the matrix representing the noise characteristic of said measuring apparatus, and wherein said matrix represents a least squares fit between said data vector and the polynomial.

8. (original) The process of claim 7 wherein said matrix is a single value decomposition of said two dimensional space as applied to said apparatus.

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9. (previously presented) The process of claim 1 further comprising the step of calculating specimen spatial artifacts from said polynomial for one or more points in said two dimensional space.

10. (previously presented) The process of claim 9 further comprising the step of transmitting said coefficients to a remote location prior to the calculation of spatial artifacts from said polynomial.

11. (currently amended) A process for generating a noise correcting matrix for a wafer measurement apparatus, comprising the steps of:

receiving data representative of artifacts in two dimensional space of a wafer specimen obtained by said apparatus, each data point associated with a data position; and

calculating a specimen-independent noise compensating matrix as a function of said data position in two dimensional space on said wafer specimen,

wherein said matrix represents a noise characteristic of said measurement apparatus.

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12. (original) The process of claim 11 wherein said calculating step applies least squares fit analysis.

13. (original) The process of claim 11 wherein said matrix is of the form of a multiplier of Zernike polynomial decomposition coefficients.

14. (currently amended) An apparatus for noise reduction from noisy data representing an artifact at sample points in two dimensional space of a wafer specimen, comprising:

means for receiving said noisy data as a vector, each element of which corresponds to one sample point; and

means for calculating coefficients of a polynomial which converts said noisy data vector to a two dimensional function continuously representing the artifact in the two dimensional space,

wherein said noisy data is obtained using a measuring apparatus, and

wherein said calculating means includes means for mathematically multiplying said data vector by a matrix representing a noise characteristic of said measuring apparatus.

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15. (previously presented) The apparatus of claim 14 wherein said wafer specimen is a non-rectilinear specimen.

16. (previously presented) The apparatus of claim 14 wherein the sample points have a sufficiency to represent the spatial frequency of the noise to be reduced.

17. (original) The apparatus of claim 14 wherein said polynomial is a Zernike polynomial.

18. (original) The apparatus of claim 14 wherein said calculated coefficients are fewer in number than the number of data points.

19. (currently amended) The apparatus of claim 14 wherein said ~~noisy data is obtained using a measuring apparatus and wherein said calculating means includes means for mathematically multiplying said data vector by a~~ matrix ~~representing~~ represents a least squares fit between the data vector and the polynomial.

20. (original) The apparatus of claim 19 wherein said matrix is a single value decomposition of said two dimensional space as applied to said measuring apparatus.

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21. (original) The apparatus of claim 14 further comprising means for calculating specimen spatial artifacts from said polynomial for one or more points in said two dimensional space.

22. (original) The apparatus of claim 21 further comprising means for transmitting said coefficients to a remote location prior to the calculation of spatial artifacts from said polynomial.

23. (currently amended) Apparatus for generating a noise correcting matrix for a wafer measurement apparatus, comprising:

means for receiving data representative of artifacts in two dimensional space of a wafer specimen obtained by said apparatus, each data point assocated with a data position; and

means for calculating a specimen-independent noise compensating matrix as a function of data position in two dimensional space on said wafer specimen,

wherein said matrix represents a noise characteristic of said measurement apparatus.

24. (original) The apparatus of claim 23 wherein said calculating means applies least squares fit analysis.

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25. (original) The apparatus of claim 23 wherein said matrix is of the form of a multiplier of a Zernike polynomial without decomposition coefficients.

26. (original) The apparatus of claim 14 wherein said means for calculating coefficients is a computer.

27. (currently amended) A model-based method of wafer shape reconstruction comprising:

obtaining a set of noisy data points representing the wafer shape by a measuring apparatus;

using a complete set of Zernike polynomials as a shape functional space;

applying a weighted least squares fit between said noisy data points and a set of data points calculated from said Zernike polynomials,

wherein said weighted least squares fit is represented by a matrix, and said matrix represents a noise characteristic of said measuring apparatus; and

finding decomposition coefficients for said wafer shape.

28. (original) The model-based method of claim 27 wherein said decomposition coefficients are a compact wafer shape data representation.

29. (original) The model-based method of claim 27 wherein said set of noisy data points form a scanning pattern that is not necessarily evenly spaced.

30. (previously presented) The apparatus of claim 14, wherein said sample points lack regular geometrically prescribed locations on said wafer specimen.

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